

I-2 STREAMBANK STABILIZATION**PURPOSE & APPLICATIONS**

Streambank stabilization consists of using vegetation or structural materials to stabilize and protect banks of streams, brooks, rivers, or excavated channels against scour and erosion from flowing water. Streambank vegetation that is sufficiently developed contributes large woody material to streams, creates critical structural elements of habitats for many different species. Still streambanks stabilized with shrub and tree vegetation provides excellent habitat for fish and wildlife species. Maine's fisheries rely on a combination of shading and leaf drop by the plants. Shading protects fish species from "thermal pollution" -- when the water heats up too much for fish to thrive. Leaf litter provides the first link in the food chain -- a food source for the insects that young fish feed on. The purpose of streambank stabilization is:

- To prevent stream damage due to utilities, roads, buildings, or other facilities adjacent to the banks,
- To maintain the capacity of the channel,
- To control channel meander that would adversely affect downstream facilities,
- To reduce sediment loads causing downstream damages and pollution,
- To improve the stream as a habitat for fish and wildlife.

Good planning before construction normally requires staying away from streams but these measures are used to stabilize and protect the banks of streams, brooks, rivers, and excavated channels that are influenced by or influence a developing area. It pertains to natural or excavated channels where the streambanks are susceptible to erosion from the action of water, ice, debris, or to damage from livestock, pedestrian, or vehicular traffic.

CONSIDERATIONS

Streambank stabilization requires the understanding of both channel formation processes and engineering applications. For many projects, engaging the services of a competent fluvial geomorphologist should be considered.

All permit requirements of local, state, and federal agencies must be obtained.

- Structural measures may be necessary to stabilize the embankments and if extensive reconstruction is required, other engineering practices should be used.
- It is far better to minimize cutting and disturbance of existing vegetation rather than to replant.
- Tree and shrub plantings are beneficial for fish habitat since they shade the water (counter acting thermal heating) and provide leaf litter (a food source). This protects fish productivity.
- Avoid using riprap as much as possible because it promotes thermal pollution. Heating occurs when stormwater runoff washes over sun-baked stone riprap. In cases where riprap is required for streambank stability, combine it with vegetative plantings to maintain good habitat.
- Pesticides and fertilizers should not be used next to streams. It is preferable to use mulch to prevent competing vegetation from killing introduced vegetation and to add organic matter.
- There may not be any increased erosion and sediment yield from the channel and surrounding areas during and immediately after construction.
- Late fall construction and seeding may fail and cause water quality deterioration in spring runoff events and these areas need to be stabilized accordingly.

SPECIFICATIONS

Any work performed within a stream or adjacent to it will need a DEP permit under NRPA (Natural Resource Protection Act). LURC permits are required in the unorganized areas of Maine. Contact the Department of Inland Fisheries and Wildlife for more information. See the detail drawings at the back of this section for the proper biostabilization methods of streambanks.

Design Criteria

- Because each reach of a stream, brook, or river is unique, measures for streambank protection must be installed according to a plan and adapted to the specific site.
- The grade must be controlled, either by natural or artificial means, before any permanent type of bank protection can be considered feasible, unless the protection can be safely and economically constructed to a depth well below the anticipated lowest depth of bottom scour.
- Streambank protection shall be started at a stabilized or controlled point and ended at a stabilized or controlled point on the stream.
- Woody debris in stream channels shall be preserved to provide fish habitat where possible and clearing of debris should be minimized since this debris provides habitat for fish species.
- Changes in channel alignment shall be made only after an evaluation of the effect on the land use, interdependent water disposal systems, hydraulic characteristics, and existing structures. Curves and meanders, deflectors and gabion wingwalls can be installed to increase fish habitat.
- Structural measures must be effective for the design flow and be able to withstand greater floods without serious damage. They shall also be designed to avoid an increase in erosion downstream of planned measures. This is accomplished by not changing the direction of flood flows and not increasing velocities by use of protective armor that is too smooth (Low "n" value).
- Vegetative protection shall be considered on the upper parts of eroding banks, especially on areas that are susceptible to infrequent inundation.

Bank protection with riprap

Refer to the RIPRAP SLOPE STABILIZATION BMP. The following is a partial list of elements that may be included in a plan for streambank protection:

- If tree removal is needed to promote the growth of desirable bank vegetation, leave root systems intact.
- Reduction of the slope of streambanks to provide a suitable condition for vegetative protection or for the installation of structural bank protection.
- Placed or dumped heavy stone, properly underlaid with a filter blanket, if necessary, to provide protection for streambanks.
- Deflectors constructed of posts, piling, fencing, rock, brush, or other materials that project into the stream to protect banks at curves and reaches subjected to impingement by high velocity currents.
- Pervious or impervious structures built on or parallel to the stream to prevent scouring streamflow velocities adjacent to the streambank.
- Artificial obstructions, such as fences to protect vegetation needed for streambank protection or to protect critical areas from damage from stock trails or pedestrian and vehicular traffic.

Construction Specifications: Measures and construction methods that enhance fish and wildlife values shall be incorporated as needed and practical. Special attention shall be given to protecting and maintaining key shade, food, den trees, and visual resources and to stabilizing disturbed areas.

Material Specifications: Refer to the RIPRAP SLOPE STABILIZATION, GABION and PERMANENT VEGETATION BMPs for this information.

Bank protection with vegetation

Stands of full-grown trees protect streambanks from erosion through the binding of soil with their roots. Shrubs provide even better erosion protection, and riverside stands of willow trees are often replaced naturally by colonies of shrub-like willows. These plants hold the soil with their root systems and reduce water velocities. They also protect tree trunks from damage caused by breaking ice and help to prevent the formation of strong eddies around large trees during flood flows. Shrub vegetation is particularly beneficial along the impact bank of a stream meander, where maximum scouring tends to occur.

Planting individual shrubs: Streambanks are often difficult to plant, even when they are well

sloped. Where mattocks or shovels are unsatisfactory tools, the planting dibble, which is a heavy metal tool with a blade and a foot pedal is the best tool. It is thrust into the ground to make a hole for the plant.

Shrub can be put into the soil as cuttings, slips or stems. Fresh cuttings should be 3/8- to 1/2-inch thick and 12 to 18 inches long. They should be kept moist. If not used at once, they should be stored in cool moist sand. Rooted cuttings should be planted vertically in the bank with 1 or 2 inches of wood protruding above the ground surface. Plantings should be made early in the spring to ensure adequate moisture for growth. For further information about general planting, consult the PERMANENT VEGETATION BMP.

Since shrubs are generally not effective for the first two years, grasses must be seeded immediately following shrub planting to provide initial streambank protection. Annual ryegrass can be immediately seeded and will sprout up within days. See the TEMPORARY VEGETATION BMP for seeding information. Mulch and an erosion control blanket such as jute netting or excelsior must be installed as well to protect bare soil on the stream banks. Refer to the TEMPORARY MULCHING BMP for more information about both.

Fascine Rolls: Willows and other softwoods can also be bound together in various ways in order to ensure immediate protection of the streambank. Fascine rolls (also known as wattles) are bundles of willow, dogwood or poplar whips that are placed across the slope on the contour. They are set against the bank so that the parts, which are to take root, touch the ground above the water level and are able to get sufficient moisture. Covering them with earth improves the contact with the ground and retards their loss of moisture.

Brush Layering: Brush layering uses the same planting materials as fascine rolls, however they are not tied together in bundles. They consist of layers of loose branches interlayered with soil. Generally longer branches are used and a greater volume of planting material is required. Fascine rolls and brush layering can be installed to deflect water away from eroding banks. The branches are set parallel to the direction of the current or at an angle of 30 to 45 degrees.

Willow Mattresses: The degree of streambank protection can be increased by using willow mattresses or packed fascine work. Willow mattresses consist of 4-to-8-inch-thick layers of growing branches set perpendicular to the direction of the current or sloping downstream, with the broad ends of the branches oriented downwards. The branches are held together with interweaving wire or other branches at intervals of 24 to 32 inches, set parallel to the direction of the current or at an angle of 30 degrees. If several layers of mattress are necessary, the tops of the lower layers should cover the bases of the upper layers. The bottom layer is fixed at the base in a trench previously dug at the base of the softwood zone. The whole mattress structure should be covered with 2 to 10 inches of earth or fine gravel.

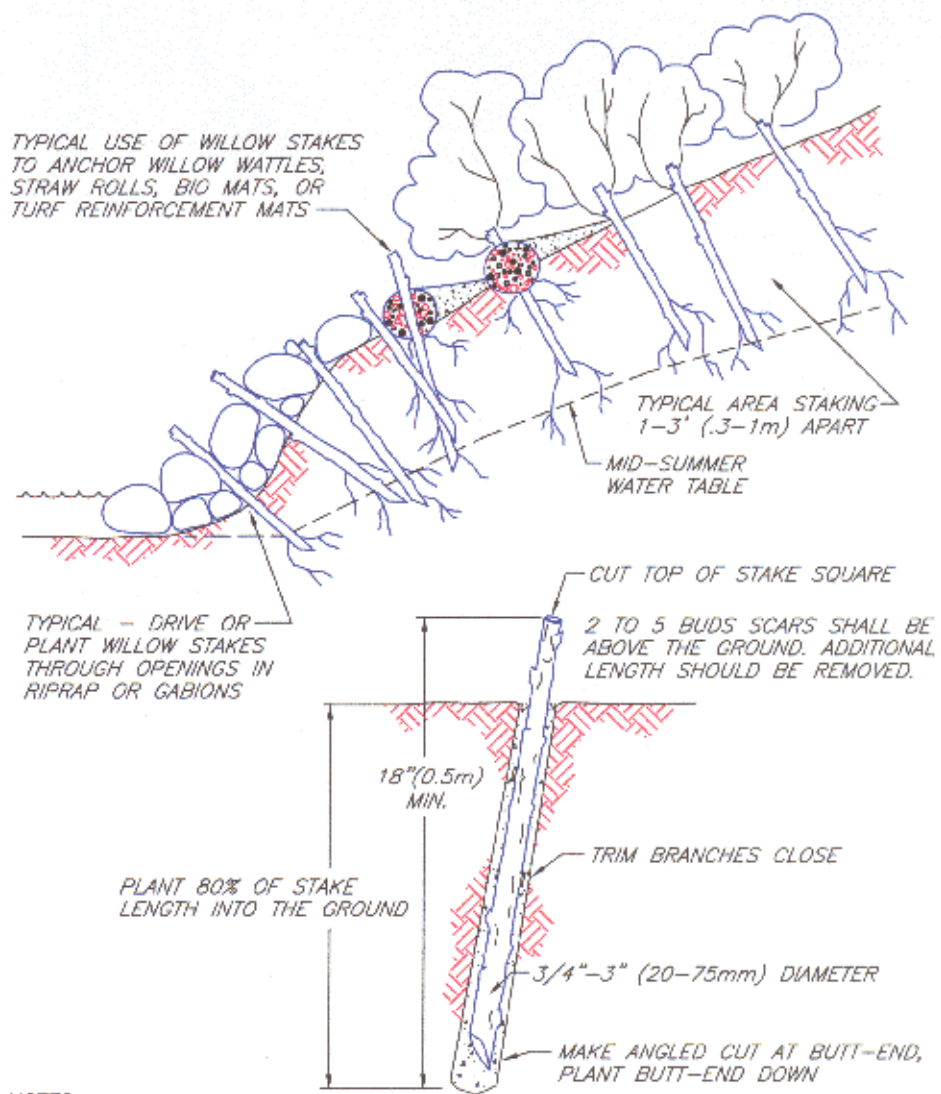
Packed Fascine-Work: Packed fascine-work consists essentially of layers of branches laid one across the other to a depth of 8 to 12 inches and covered with fascine rolls. The spaces between the fascine rolls are filled with gravel, stones and soil so that no gaps remain; and a layer of soil and gravel 8 to 12 inches thick is added on top. Packed fascine-work is particularly suitable for repairing large breaches in the banks of streams.

Combination with Riprap Facing: In many places, the bank is not adequately protected by vegetation until the roots are fully developed, and inanimate materials must provide temporary protection. There is a wide choice of methods, including the planting of woody plants in the crevices of stone facing. Generally a combination of vegetation with RIPRAP or GABIONS is preferred. Refer to the BMPs for each of these practices for more information.

Establishing Tree Vegetation: The presence of trees along streams is critical for maintaining good wildlife habitat, and provides the shade and leaf litter essential to Maine's fisheries. Tall trees should be planted along stream, especially on the southern side, to provide shade. In some cases, mature trees will be required for immediate shading.

MAINTENANCE

Streambanks are always vulnerable to new damage. Repairs are needed periodically. Banks should be checked after every high-water event is over. Gaps in the vegetative cover must be fixed at once with new plants, and mulched if necessary. Fresh cuttings from other plants on the bank can be used, or they can be taken from mother-stocked plantings if they are available.

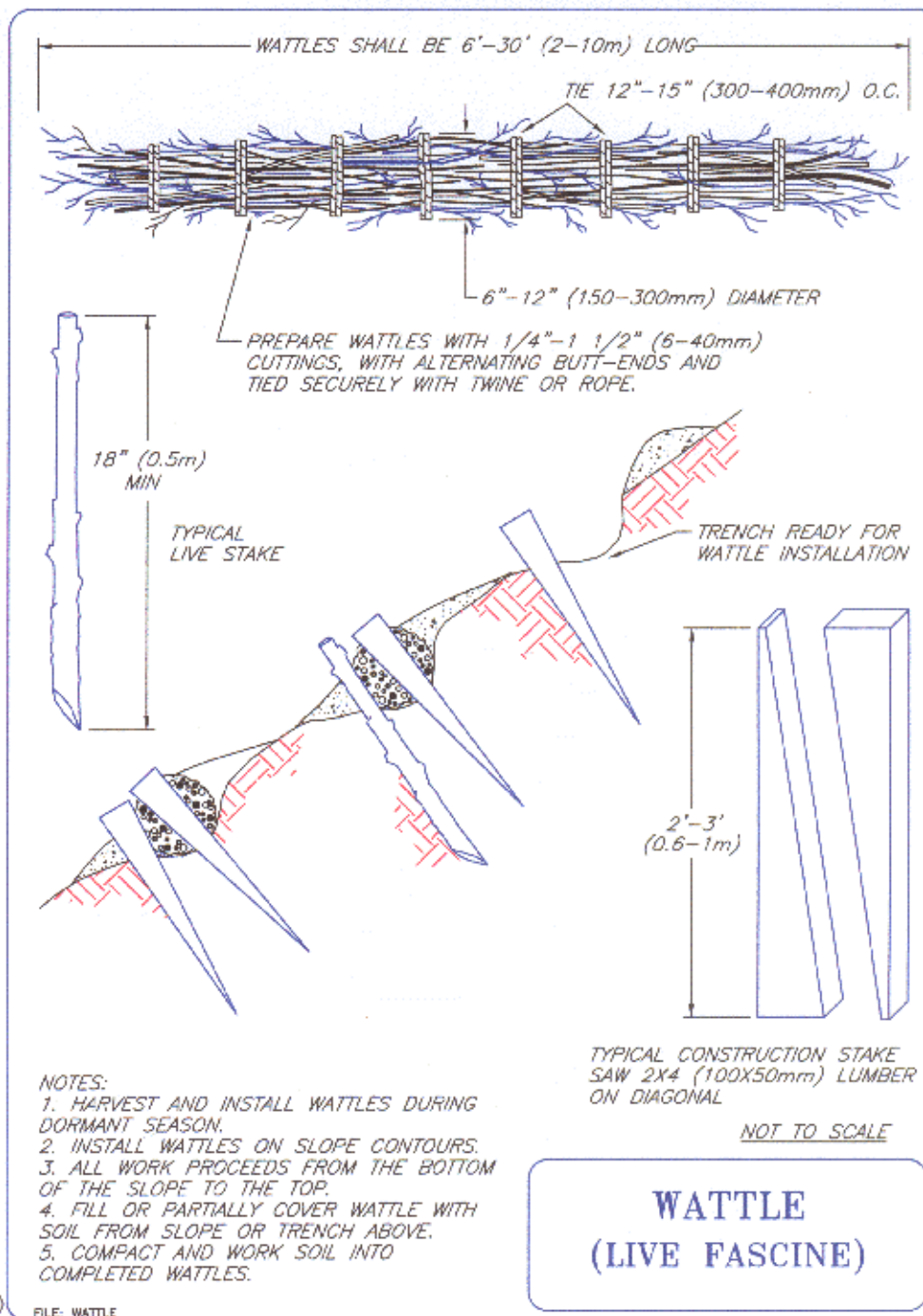


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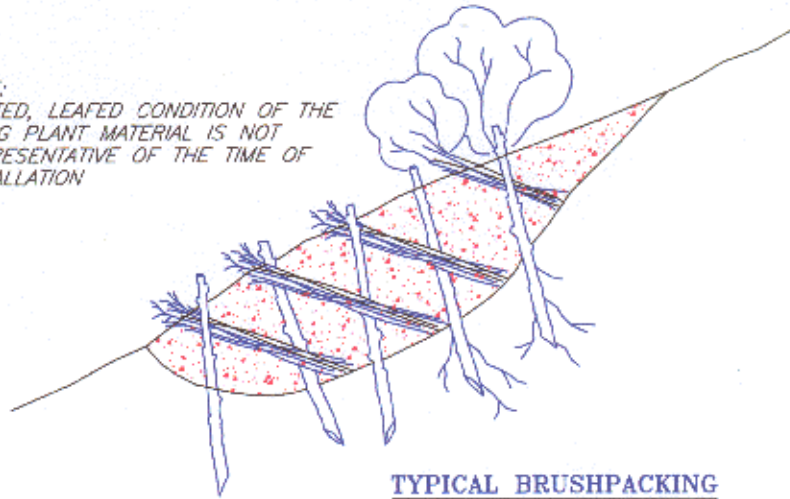
1. HARVEST AND PLANT STAKES DURING THE DORMANT SEASON.
2. USE HEALTHY, STRAIGHT AND LIVE WOOD AT LEAST 1 YEAR OLD.
3. MAKE CLEAN CUTS AND DO NOT DAMAGE STAKES OR SPLIT ENDS DURING INSTALLATION, USE A PILOT BAR IN FIRM SOILS.
4. SOAK CUTTINGS FOR 24 HOURS (MIN.) PRIOR TO INSTALLATION.
5. TAMP THE SOIL AROUND THE STAKE.

NOT TO SCALE

LIVE STAKING

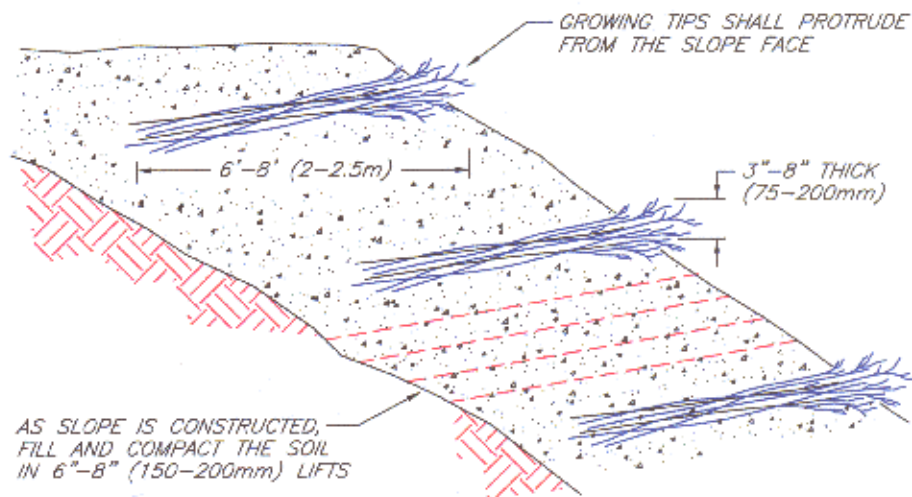


NOTE:
ROOTED, LEAFED CONDITION OF THE
LIVING PLANT MATERIAL IS NOT
REPRESENTATIVE OF THE TIME OF
INSTALLATION



TYPICAL BRUSHPACKING

COVER BRUSHLAYER IMMEDIATELY WITH
6" (150mm) OF FILL SOIL, WATER AND
COMPACT ACCORDING TO SPECIFICATIONS



**TYPICAL BRUSHLAYERING
WITH SLOPE CONSTRUCTION**

BRUSHLAYERING

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